

REMARKS

Request for Examiner's Interview

The Applicant and the Applicant's attorney hereby requests an interview with the Examiner in order to expedite the prosecution of the present application.

Pending Claims

Claims 1, 4-22, and 45-46 are pending. Claims 23-44 are cancelled. Claims 1, 12-13, and 45 are amended. The Applicant respectfully requests reconsideration of the pending claims in light of the claim amendments and arguments presented herein.

Rejections under 35 U.S.C. §103(a):

Claims 1, 5, 8-10, 12-16, 18, 22 and 45 are rejected under 35 U.S.C. §102 as being anticipated by U.S. Patent 4,767,218 to Boys et al. (hereinafter "Boys") in view of Haag.

Independent Claim 1

The Office Action states that Boys teaches a magnetron sputtering source that includes all the elements of independent claim 1 except for the switch and the common power supply for the cathode segments during operation. In addition, the Office Action states that Haag teaches segmented cathode and anode segments with a power supply and switch present in the generator. The Office Action concludes that at the time of the invention, it would have been obvious to one of ordinary skill in the art to apply the voltage of one generator, or power source, to multiple cathodes at one time as in Haag instead of applying voltage to each cathode individually as in

Boys because both allow for similar control over the power itself resulting in the ability to control the distribution of plasma deposition over the surface of the workpiece.

Independent claim 1 has been amended to recite that at least one of a rise time, amplitude, pulse duration, fall time, and pulse shape of at least some of the voltage pulses in the train of voltage pulses is chosen to increase the generation of metal ions. This claim amendment is supported by the originally filed specification. For example, the present application describes that in conventional deposition systems it is not possible to generate a significant number of metal ions unless a train of voltage pulses is used with the rise times, amplitudes, pulse durations, fall times, and pulse shapes described in the specification. See, for example, paragraph 43. This feature of the invention is not described in any of the prior art references. Page 7 of the office action indicates that the Boys sputtering magnetron will generate meal ions from the target. The Applicant submits that the sputtering magnetron described in Boys will not generate metals ions in any significant quantity. That is, any metal ions generated by the sputtering magnetron described in Boys will have no significance on the process results.

The Applicant submits that the time modulated generators described in Haag do not generate the claimed train of voltage pulses. Instead, the time modulated generator generates a control signal which activates power supplies that generate an output voltage. In other words, the time modulation described in Haag is the generation of a time dependent control signal that will activate and deactivate particular power supplies that are connected to particular magnetrons. That is, the time modulated control signals are not changing the output voltage waveform of any particular power supply when it is generating the plasma. Note that the modulation signal is not connected to magnetrons (Fig. 1). In addition, even if Haag did

describe the generation of voltage pulse train, Haag does not describe a means to control the shape of the pulses in the voltage pulse train to increase the generation of metal ions.

In addition, the claimed switch is not described in any of the prior art references. On page three of the Office Action, it is stated that the generators described in Haag feature time modulation which operates as a switch. The claimed switch is a device that redirects the train of voltage pulses generated by the pulsed power supply. The claimed switch does not operate as a traveling wave as described in Haag. The claimed switch is not activating and deactivating the pulse power supply. Instead, the claimed switch is connected between output of pulse power supply and magnetrons. Such a configuration greatly simplifies the requirements of the pulsed power supply and reduces the cost of the system.

None of the prior art references of record alone, or in combination, describes an I-PVD source including the claimed combination. In light of the above arguments and amendment to independent claim 1, the Applicant submits that claim 1 is allowable over the prior art of record. In addition, the Applicant submits that dependent claims 4-22 are allowable as depending on an allowable base claim.

Independent Claim 45

Independent claim 45 has been amended to recite that at least one of a rise time, amplitude, pulse duration, fall time, and pulse shape of at least some of the voltage pulses in the train of voltage pulses generated by the means for generating a train of voltage pulses is being chosen to increase the generation of metal ions. As described in connection with the rejection of claim 1, an I-PVD source including the claimed combination is not found in the prior art of

record. Therefore, the Applicant submits that the independent claim 45 is allowable and that dependent claim 46 is allowable as depending from an allowable base claim.

Dependent Claim Rejections

Claim 4 is rejected under 35 U.S.C. §103(a) as being unpatentable over Boys and Haag in view of Bergman. Claim 6 is rejected under 35 U.S.C. §103(a) as being unpatentable over Boys and Haag in view of Rogers. Claim 7 is rejected under 35 U.S.C. §103(a) as being unpatentable over Boys and Haag in view of Sieck. Claim 11 is rejected under 35 U.S.C. §103(a) as being unpatentable over Boys and Haag in view of Hoffman. Claims 17 and 46 are rejected under 35 U.S.C. §103(a) as being unpatentable over Boys and Haag in view of Glocker. As described herein, the Applicant submits that independent claims 1 and 45 are allowable over the prior art of record. Therefore, the Applicant submits that dependent claims 4, 6, 7, 11, 17, and 46 are allowable as depending from an allowable base claim.

CONCLUSION

Claims 1, 4-22, and 45-46 are pending. Claims 23-44 are cancelled. The Applicant respectfully requests reconsideration of the pending claims in light of the above arguments. The undersigned attorney would welcome the opportunity to discuss any outstanding issues, and to work with the Examiner toward placing the application in condition for allowance.

Respectfully submitted,

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